

Effect of ultrasonic pre-treatment on low temperature acid hydrolysis of oil palm empty fruit bunch

ABSTRACT

Various pre-treatment techniques change the physical and chemical structure of the lignocellulosic biomass and improve hydrolysis rates. The effect of ultrasonic pre-treatment on oil palm empty fruit bunch (OPEFB) fibre prior to acid hydrolysis has been evaluated. The main objective of this study was to determine if ultrasonic pre-treatment could function as a pre-treatment method for the acid hydrolysis of OPEFB fibre at a low temperature and pressure. Hydrolysis at a low temperature was studied using 2% sulphuric acid; 1:25 solid liquid ratio and 100 °C operating temperature. A maximum xylose yield of 58% was achieved when the OPEFB fibre was ultrasonicated at 90% amplitude for 45 min. In the absence of ultrasonic pre-treatment only 22% of xylose was obtained. However, no substantial increase of xylose formation was observed for acid hydrolysis at higher temperatures of 120 and 140 °C on ultrasonicated OPEFB fibre. The samples were then analysed using a scanning electron microscope (SEM) to describe the morphological changes of the OPEFB fibre. The SEM observations show interesting morphological changes within the OPEFB fibre for different acid hydrolysis conditions.

Keyword: OPEFB fibre; Dilute acid hydrolysis; Ultrasonic pre-treatment